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294-81•21 AU 313 48004

GB 2031841
APR 1980

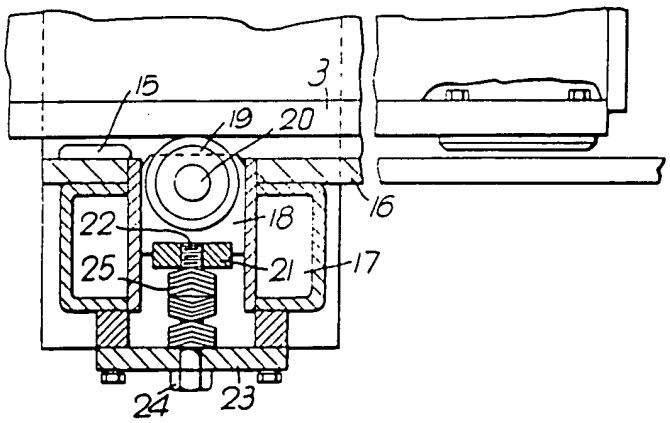
(12) UK Patent Application (19) GB (11) 2 031 841 A

(21) Application No **7841615**
(22) Date of filing **23 Oct 1978**
(23) Claims filed **26 Jul 1979**
(43) Application published
30 Apr 1980
(51) **INT CL³**
B66C 1/62
(52) Domestic classification
B8H KC
(56) Documents cited
GB 1434476
GB 1351790
GB 1254966
GB 1144626
GB 1120049
GB 890363
(58) Field of search
B8H
(71) Applicants
Lancer Boss Limited.
Grovebury Road,
Leighton Buzzard,
Bedfordshire.
(72) Inventors
Walter George Wardle.
(74) Agents
Page, White & Farrer.

(54) **Load lifting frames for use with load lifting vehicles and equipment**

(57) A load lifting frame or attachment suitable for use with load lifting apparatus or vehicles comprising a main frame supportable by load moving devices, a subsidiary frame 3 movable relatively to the main frame, and at least one resiliently mounted roller 19 on each frame urged by resilient devices 25 into rolling engagement with the other frame. The resilient devices are each prestressed within predetemined limits comparable to the unladen weight of the load bearing members so as to yield and render the rollers inoperable when the two frames are in loaded stationary relationship. Each roller of the subsidiary frame is mounted at the outer end of the subframes path of travel with respect to the main frame and each roller on the main frame is at the inner end of the path of travel.

Fig.3



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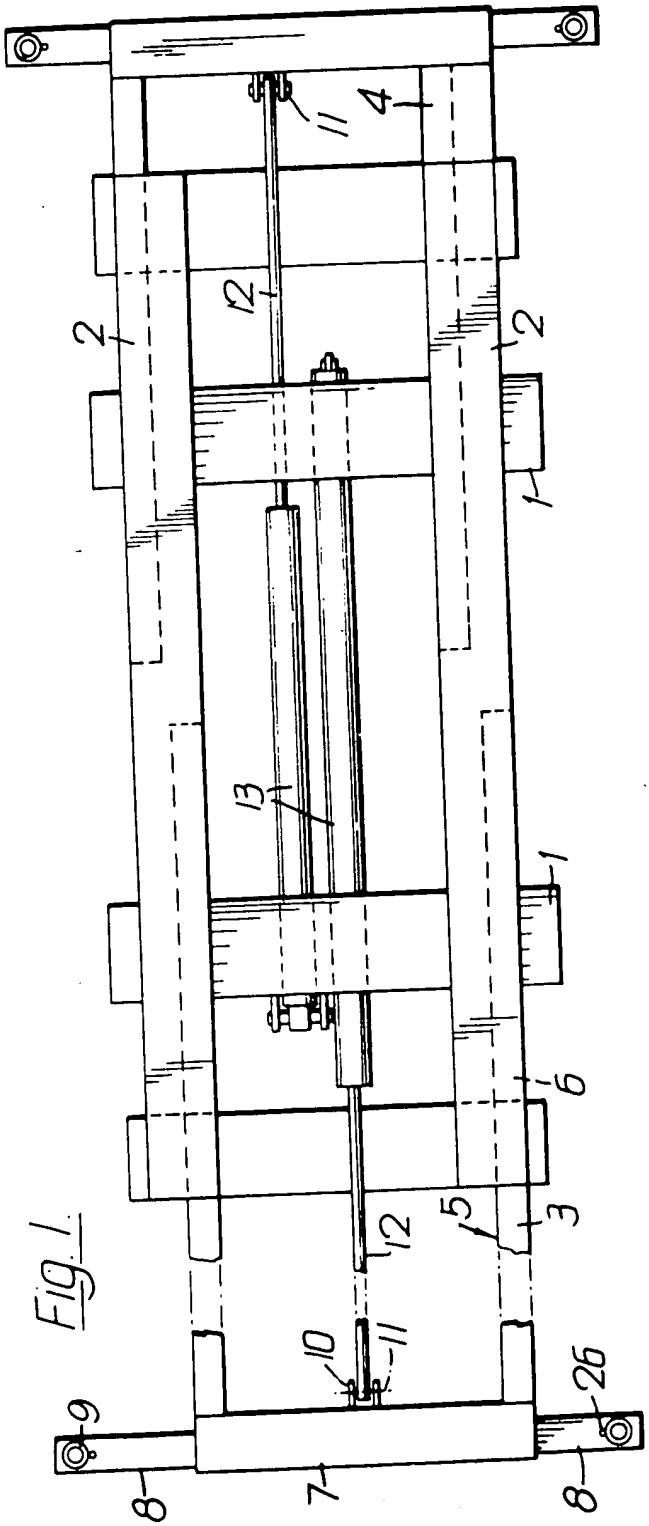


Fig.1

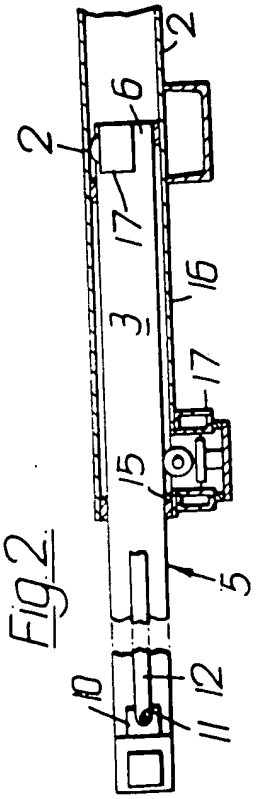


Fig.2

Fig.3.

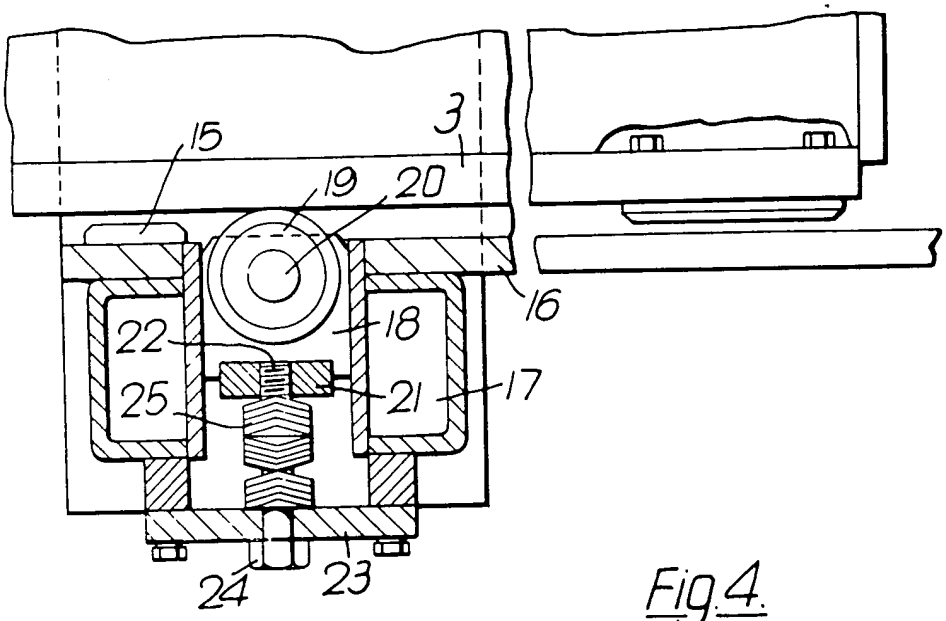
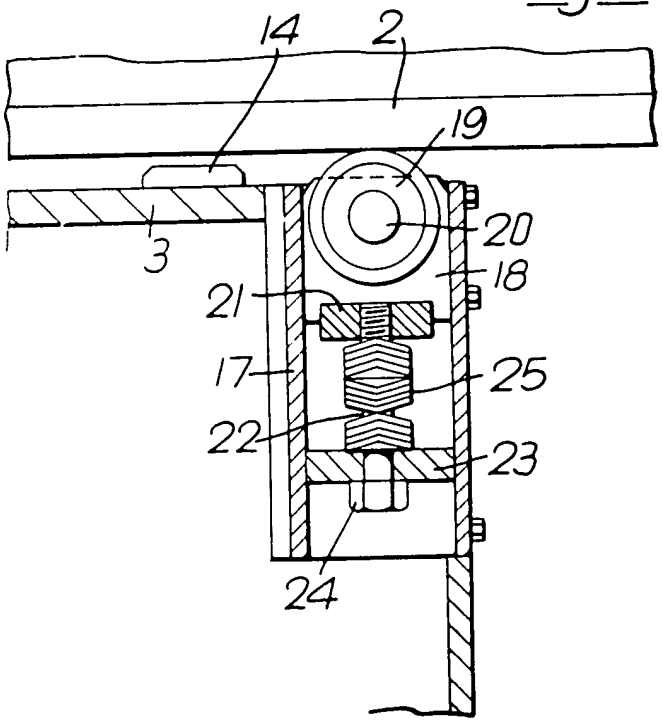


Fig.4.



SPECIFICATION

Load lifting frames for use with load lifting vehicles and equipment

This invention relates to load lifting frames as used on load lifting apparatus and machines and on vehicles such as fork lift trucks.

Such frames have means such as twist lock units for engaging and securing a load, such as a containerisation container, to be lifted or manoeuvred. For use with fork lift trucks, be they front loaders or sideloader, the frames or attachments, as they are termed, comprise means such as channel sections which slide onto and off the forks for raising or lowering them. Moreover such attachments are often telescopically constructed so as to be extensible or contractable in a direction normal to the longitudinal axes of the channel sections so as to be adjusted in length for engaging loads of different lengths. The attachments comprise a main frame in which a telescopic frame is moved by power operated means at one or both ends of the main frame. Usually the power operated means comprises an hydraulic ram or chain drive system controlled from the cab of the vehicle driver or other control position e.g. beside the vehicle. The outer end of each telescopic frame and/or main frame (where only one telescopic frame is used) has mounted thereon load securing means such as twist lock units for lockingly securing the attachment to the load.

In some such known frames or attachments the telescopic frame slides on or within the main frame which necessitates the engaging surfaces of the main and telescopic frames being of steel of specified degrees of hardness, but it has been found that without the use of greases or other lubricants or specially wear resistant sliding surfaces on the contacting telescoping parts, substantial forces are required to effect the telescopic action which increases the size and cost of the prime mover as well as leading to wear of the sliding surfaces and renders the telescopic action costly to produce, use and maintain.

The main object of the present invention is to provide telescopic lifting frames or fork lift attachments in which the aforesaid disadvantages are minimised or substantially eliminated, but the invention is equally applicable to any lifting means mounted on the main load supporting elements such as all kinds of fork lift truck lifting means e.g. forks.

It is to be understood that each lifting frame or attachment is designed and calibrated for use in lifting loads within a predetermined load range.

According to the present invention a load lifting frame or attachment suitable for use with load lifting apparatus or vehicles fitted with load bearing members, comprises a main load bearing frame capable of being supported on load lifting and/or lowering devices, a subsidiary frame movable relatively to the main frame, and resiliently mounted rollers mounted on one frame and urged by resilient devices into rolling engagement with the other frame, the resilient devices being prestressed within predetermined limits comparable to the unladen weight of the load bearing members of the apparatus and capable of becoming inoperable when the two frames are in loaded stationary relationship.

The main and subsidiary frames are preferably provided with spaced rollers, the roller or rollers being mounted on the subsidiary frame at the outer end of its path of travel with respect to the main frame and mounted on the main frame at the inner end of said path of travel.

Each roller is preferably rotatably mounted on a movable member movable with respect to the frame it engages and said movable member is subjected to the force exerted by a calibrated resilient device. Preferably the resilient device comprises a calibrated initially stressed spring. A suitable spring is a plurality of disc springs which may be increased or reduced to provide the predetermined force on the roller. While the invention is primarily useful with lifting attachments operable on the forks of fork lift trucks it will be understood that apparatus in accordance therewith can be used with any load lifting apparatus and or vehicles.

The invention will now be further described by way of example with reference to a telescopic lifting attachment for use with a fork lift truck. The example is shown in the accompanying drawings in which:

Figure 1 shows diagrammatically the plan of a telescopic lifting attachment for use on the forks of a fork lift truck;

Figure 2 is a side elevation of the attachment of Figure 1 showing only the left hand end;

Figure 3 shows on a larger scale in greater detail the construction of the resiliently mounted roller on the main frame of the attachment of Figures 1 and 2, and

Figure 4 is a similar detail to Figure 3 but showing the construction of the resiliently mounted roller on the telescopic frame of the attachment.

In the drawings the same references are used to designate the same or similar parts.

Referring to the drawings these show a load lifting frame used in the horizontal plane with the forks of a fork lift truck for lifting loads. The frame comprises two channel members 1 adapted to ride on to the horizontal arms of the two forks of a conventional fork lift truck which could be a front lift truck or a side loader.

The channel members support two longitudinal members 2 of a main frame to which they are permanently secured by any suitable means such as bolts or welding or conventional form.

The main frame members 2 are rectangular tubular members within which slide telescopic extensions 3 and 4, which may be I-beams, rectangular hollow members or other suitable form and form at each end of the main frame a telescopic frame.

Each of the extensions 3 and 4 comprises an elongated member 5 having its inner end 6 telescopically disposed within the main frame member 2. The outer end is connected to a cross bar 7 from which extend arms 8 carrying twist lock units 9 at their outer ends. The two telescopic extensions 3, 4 slide on opposite sides of the main frame members 2 so that at their inner ends within the main frame they

may overlap if necessary. Each of the cross bars 7 has brackets 10 in which is pivotted on a pin 11 a rod 12 extending into a cylinder 13 fixed to the main frame and operated hydraulically in the conventional manner. Thus on operation of the cylinder 13 the rod 12 is extended or retracted whereby the telescopic extension is moved in and out of the main frame. This is similarly constructed at each end of the main frame as seen in Figure 1. Thus it can be seen that by operation of the cylinders or any other operative means such as winches and cables or chain drive system of conventional construction the telescopic frames can be extended or retracted whereby the twist lock units carried by them are brought into alignment with the cooperating receiving slots on the load to be lifted such as a container in containerisation work.

Hitherto such attachments have been made with the telescopic frames sliding within the main frame and provided with hard wearing surfaces to resist friction losses and wear. This is satisfactory once the load is supported by the attachment, and the large bearing surfaces between the telescopic frames and the beams of the main frame spread the load over a large area which enables the parts of the attachment to be made inexpensively and of minimum weight. However, during movement of the telescopic members within the main frame whether they be loaded or unloaded, the wear is substantial and the size of the prime mover such as cylinders or chain drive system 13 has to be robustly constructed to overcome the friction losses as well as the frames having to be large enough to bear the forces imposed on them.

When each telescopic extension moves in the main frame, as can be seen more clearly from Figure 2, the bending moment forces downward through the twist lock units 9 means that the inner ends of the telescopic extensions 3 are forcably engaged on the underside of the top wall of the member 2 and its central section is similarly engaged on the upper side of the bottom wall of the member 2.

As seen in Figures 2, 3 and 4 the present invention provides means for overcoming the aforesaid disadvantages. Each telescopic extension is therefore provided with a resiliently operated roller on its inner end on its upper side to roll along the underside of the top wall of the main frame member 2 while the outer end of the lower wall of the member 2 has a similarly disposed roller to engage the underside of the telescopic element. Stops are provided on the telescopic extension 3 and the member 2 to prevent the telescopic extensions moving out of the main frame.

As seen in Figure 3 which shows the bottom wall of the member 2 at 16, this is provided at its outer end with a box construction 17 in which slides a box-like element 18 within which is journalled a roller 19 on a pin 20. The pin 20 may be freely rolling in bearings in the box-like element 18 or it may be fixed therein. The box-like element 18 has fixed to it a block 21 carrying a rod 22 bolted at its lower end to the bottom 23 of this roller mounting. The rod 22 is threaded into the block 21 so that by rotation of the rod the box-like element can be raised or lowered to a predetermined position. The block 21 with the rod 22 are however, free to slide up and down within a bearing 24 in the bottom of the mounting 23. Surrounding the rod 22 is a resilient device which is calibrated to yield at a certain predetermined load on the wheel 19 and normally urges the rod 22 into its uppermost position.

In the construction shown the resilient device comprises a stack of disc springs arranged in sets with their apices oppositely directed as shown, and the number of washers may be increased or decreased when erecting the attachment to suit the predetermined load on the roller 19 at which they yield.

The resilient device 25 may, however, be of any other conventional construction such as a compression spring or a resilient material.

Referring to Figure 4, this shows a similar roller disc springs mounting to Figure 3 but attached to the top inner end of the telescopic member 3 in engagement with the top inside wall face of the main beam 2. It functions in the same way as described with reference to Figure 3.

In operation when the attachment is disposed to lift a load the cylinder 13 is operated to extend or contract the telescopic extensions 3, 4 and during that operation the washers 25 maintain each of the box-like elements 18 in its uppermost position in its mounting so that the roller engages the underside of the telescopic extensions and the main frame top wall as described herein. The telescopic extensions 3, 4 are then moved easily within the main beam because they ride on the freely running rollers 19 and there is no sliding engagement with the walls of the top and bottom of the main beam. When the attachment by operation of the forks of the fork lift truck engages the load with the twist lock units 9 the load on the telescopic frames is greater than the calibrated upward force of the disc springs 25 which yield so that the surfaces of the telescopic extensions come into metal to metal contact with the pads 15 on the main frame members 2.

Thus by operation of the device, movement of the telescopic frames within the main frame is easily carried out with the minimum of force by the prime mover 13, but when the telescopic elements are loaded by the load being lifted, that load is spread over a wide area of the telescopic parts thereby retaining the advantages of the load being spread over a wide area. Hence the frames can be made of lighter construction than with the known attachments.

If desired the twist lock unit operating mechanism indicated at 26 which is of standard construction, may be connected with either the telescopic frames or the main frame or with the prime mover 13, so that when a load is engaged by the twist lock units for lifting the telescopic extensions are locked in the main members 2 so that there is no telescopic movement of the attachment when loaded.

The rollers 19 are mounted on the pins 20 by sealed ball bearings (not shown) so that they can with their initial lubrication run for considerable periods of time without lubrication or other maintenance requirements.

By means of the present invention a more satisfactory telescopic load lifting attachment is provided where the moving parts are made with a minimal amount of materials and operated with a minimum of forces exerted by the prime mover.

CLAIMS

1. A load lifting frame or attachment suitable for use with load lifting apparatus or vehicles fitted with load bearing members, comprising a main load bearing frame capable of being supported on or by load lifting and/or lowering devices, a subsidiary frame moveable relatively to the main frame, and resiliently mounted rollers mounted on one frame and urged by resilient devices into rolling engagement with the other frame, the resilient devices being prestressed within predetermined limits comparable to the unladen weight of the load bearing members of the apparatus and capable of becoming inoperable when the two frames are in loaded stationary relationship.

2. A load lifting frame or attachment according to claim 1 wherein the main and subsidiary frames are provided with spaced rollers, the roller or rollers being mounted on the subsidiary frame at the outer end of its path of travel with respect to the main frame and mounted on the main frame at the inner end of said path of travel.

3. A load lifting frame or attachment according to claim 1 or 2 wherein each subsidiary frame is provided with a resiliently operated roller on its inner end on its upper side to roll along the underside of the top wall of the main frame while the outer end of the lower wall of the main frame has a similarly disposed roller to engage the underside of the subsidiary frame.

4. A load lifting frame or attachment according to any of claims 1 to 3 wherein each roller is rotatably mounted on a member movable with respect to the frame it engages and is subjected to the force exerted by a calibrated resilient device.

5. A load lifting frame or attachment according to any of claims 1 to 4 wherein the resiliently mounted roller carried by the main and or subsidiary frame is rotatably supported by an element movable in a guide on the frame, and the element is secured to a member movable along the guide and urged towards the operable position of the roller by resilient means constrained between the guide and the movable member.

6. A load lifting frame or attachment according to any of claims 1 to 5 wherein the resilient device is a calibrated initially stressed spring.

7. A load lifting frame or attachment according to claim 7 wherein the spring is formed of a plurality of disc springs which may be varied in number or variably stressed to exert a predetermined force on the roller.

8. A load lifting frame or attachment substantially as herein described with reference to Figures 1 to 4 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by Croydon Printing Company Limited, Croydon Surrey, 1980.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.